

What is claimed is

1. An electronic safety system, for the avoidance of an overspeed condition in the event of a shaft failure by detection of the shaft failure and subsequent interruption of further energy supply to the shaft, comprising:
 - at least one measuring light guide, which extends longitudinally along the shaft and which is attached to and co-rotates with the shaft, the at least one measuring light guide having a light inlet side constructed and arranged to receive an input light and a light outlet side constructed and arranged to output the input light;
 - a light source positioned to input light into the input side of the measuring light guide;
 - an optical sensor positioned to sense the output light from the outlet side of the measuring light guide;
 - the at least one measuring light guide attached at both a driven end and a driving end of the shaft in a manner such that a failure of the shaft between the driven end and the driving end ruptures the measuring light guide, thereby cutting light transmission between the light source and the optical sensor through the at least one measuring light guide;
 - evaluation electronics for evaluating received light signals at the optical sensor and indicating a shaft failure upon receipt of changed light signals at the optical sensor due to rupture of the at least one measuring light guide; and
 - control electronics for interrupting an energy supply to a driving side of the shaft when a shaft failure is indicated by the evaluation electronics.
2. An electronic safety system in accordance with Claim 1, wherein the light source and the sensor are positioned adjacent to the light inlet side and the light outlet side, respectively, of the at least one measuring light guide.
3. An electronic safety system in accordance with Claim 1, and further comprising auxiliary light guides, wherein the light source and the sensor are positioned remote from the at least one measuring light guide and are

optically coupled with the at least one measuring light guide via the auxiliary light guides .

4. An electronic safety system in accordance with Claim 1, wherein the light inlet side of the at least one measuring light guide is positioned at an axis of the shaft while the light outlet side of the at least one measuring light guide is positioned radially outwardly with respect to the shaft.
5. An electronic safety system in accordance with Claim 1, wherein the light inlet side and the light outlet side of the at least one measuring light guide are positioned radially outwardly from an axis of the shaft.
6. An electronic safety system in accordance with Claim 5, and further comprising at least one of an annular light guide or an annular light source for supplying light to the at least one measuring light guide.
7. An electronic safety system in accordance with Claim 6, wherein the annular light guide is connected immediately to the at least one measuring light guide.
8. An electronic safety system, in accordance with Claim 1, wherein the at least one measuring light guide is routed as a loop, with the inlet and outlet side being positioned on a same shaft end.
9. An electronic safety system in accordance with Claim 8, and further comprising a measuring sleeve which is connected between the driven end and the driving end of the shaft and which retains the at least one measuring light guide.
10. An electronic safety system in accordance with Claim 9, wherein the measuring sleeve comprises an inner tube and an outer tube surrounding the inner tube for radially retaining the at least one measuring light guide therebetween, at least one of the tubes including at least one retaining

groove which accommodates and circumferentially retains the at least one measuring light guide.

11. An electronic safety system in accordance with Claim 10, wherein the inner tube includes the retaining groove, the inner tube constructed to be weaker than the outer tube to act as a rupture tube upon shaft failure.
12. An electronic safety system in accordance with Claim 11, wherein the inner tube is constructed of a weaker material than the outer tube.
13. An electronic safety system in accordance with Claim 1, and further comprising a measuring sleeve which is connected between the driven end and the driving end of the shaft and which retains the at least one measuring light guide.
14. An electronic safety system in accordance with Claim 13, wherein the measuring sleeve comprises an inner tube and an outer tube surrounding the inner tube for radially retaining the at least one measuring light guide therebetween, at least one of the tubes including at least one retaining groove which accommodates and circumferentially retains the at least one measuring light guide.
15. An electronic safety system in accordance with Claim 14, wherein the inner tube includes the retaining groove, the inner tube constructed to be weaker than the outer tube to act as a rupture tube upon shaft failure.
16. An electronic safety system in accordance with Claim 15, wherein the inner tube is constructed of a weaker material than the outer tube.
17. An electronic safety system in accordance with claim 16, wherein the shaft is a shaft of a gas turbine engine.
18. An electronic safety system in accordance with claim 1, wherein the shaft is a shaft of a gas turbine engine.

19. An electronic safety system in accordance with Claim 3, and further comprising a measuring sleeve which is connected between the driven end and the driving end of the shaft and which retains the at least one measuring light guide.
20. An electronic safety system in accordance with Claim 19, wherein the measuring sleeve comprises an inner tube and an outer tube surrounding the inner tube for radially retaining the at least one measuring light guide therebetween, at least one of the tubes including at least one retaining groove which accommodates and circumferentially retains the at least one measuring light guide.
21. An electronic safety system in accordance with Claim 20, wherein the inner tube includes the retaining groove, the inner tube constructed to be weaker than the outer tube to act as a rupture tube upon shaft failure.
22. An electronic safety system in accordance with claim 1, and comprising a plurality of measuring light guides.